‘Shake, rattle, and roll’ gets an update after 60 years

Test Capabilities Revitalization upgrades support NW mission

By Stephanie Hobby

It sits in the heart of the New Mexico desert, windswept and quiet until a sudden, earth-shattering boom interrupts the tranquility. Sandia’s remote areas have long been known for their exciting test capabilities, and with a decade-long, $100 million renovation wrapped up this spring, the area will often be shaking, rattling, and rolling.

Some of Sandia’s most well-known tests have been conducted in this remote space, with its powerful and soaring structures. *Wired* magazine once said that if Sandia is the nation’s science playground, Tech Area 3 is its sandbox.

While the tests conducted there are admittedly fun to

(Continued on page 5)

ON THE RIGHT TRACK — Sandia engineer and project manager Michael J. Vigil (1533) is part of a team that oversees tests done at the 10,000-foot rocket sled track. The wiring systems on the track were completely rebuilt during the Test Capabilities Revitalization. (Photo by Randy Montoya)

Engineered Safety

The Microsystems Engineering Sciences and Applications (MESA) staff leaves nothing to chance in dealing with the toxic gases the complex needs for its work. See story on page 8.

Sandia LabNews

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Family Day 2014 planning moving along

But pay close attention to registration details

Although Family Day 2014 isn’t until Saturday, Sept. 20, here’s an alert!

Advance planning by Sandia Members of the Workforce (MOW) who want to attend and serve as hosts for this special event is a must and some deadlines for action are coming up soon.

Failure to meet deadlines or to provide required information about yourself or your guests could leave you outside the virtual Family Day 2014 door looking in.

The various registration and credentialing details will be clearly spelled out when the Family Day 2014 website goes live on July 14. There also will be more information in upcoming issues of *Lab News* and the *Sandia Daily News*.

But, here are some vital examples where quick action is absolute:

• If you want a foreign national guest to attend, you must contact the Foreign Interactions Office by Aug. 1.

• If you are a foreign national MOW who plans to attend, you must contact the Foreign Interactions Office by Aug. 20.

Pam Catanach (3652), who heads up planning for this year’s Family Day, recognizes that some of the requirements regarding attendance are different than for the recently held Take Our Daughters and Sons to Work Day.

“The logic for this is pretty straightforward,” Pam says. “Take Our Daughters and Sons to Work Day occurred on a weekday. Family Day 2014 will be on a weekend. Both Sandia and Kirtland Air Force Base regulations are more restrictive on weekends.”

Family Day FAQs

Here’s a Family Day 2014 Frequently Asked Questions (FAQ) “Lite” worth paying attention to now. A more robust FAQ document will be on the upcoming event website.

• Who can serve as a host for Family Day 2014?

The following personnel will be permitted to escort a maximum of eight US citizen visitors.

• Sandia Active, US citizen Members of the Workforce (MOW).

• DOE/NNSA/SFO, US citizen, employees.

• Who can attend Family Day 2014 as guests?

Employee's spouse, children, parents, siblings, grandparents, grandchildren, father-in-law, mother-in-law, son-in-law, daughter-in-law, brother-in-law, sister-in-law, step-children, foster children, step-parents, foster parents, and any relative who is a dependent of the employee. If the MOW host has none of the above, they may bring one US citizen friend. Hosts will be allowed to escort the capacity of the vehicle driven onto Kirtland Air Force Base up to a maximum of eight. It is the responsibility of MOW hosts to verify US citizenship of their guests.

• Can retired Sandia employees attend Family Day 2014?

A retiree can attend only if they are either an immediate family member guest of the host or a single friend in lieu of having immediate family living in the Albuquerque area.

• Will food be served at Family Day 2014?

Yes. As part of one of the event’s themes – promoting health of the workforce – a complimentary healthy light lunch will be offered. A component of the online registration will be to identify whether your party plans to eat lunch and at what locations: Hardin Field, the Steve Schiff Courtyard, the Thunderbird Café, or the Area IV Café.

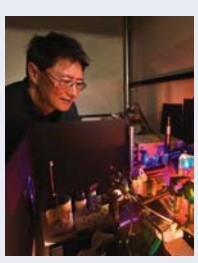
• What are the hours for Family Day 2014 activities?

9 a.m. to 3 p.m., Saturday, Sept. 20.

Cyber Tech Academy

In the world of cybersecurity, who better to learn from than the professionals who live and breathe that world? High school students are doing just that through Sandia’s Cyber Technologies Academy, which focuses on computer science and cybersecurity. Story, photos on **pages 6-7.**

Inside . . .



Power to the people

Semiconductors have had a mind-boggling impact on society. But your sleek cell phone and trusty GPS are only the beginning. Smaller, faster electronics are still to come. Sandia is playing a key role in the research. See **page 12.**

That's that

There we were, my colleagues and I, celebrating the birthday of one of our own, a gentleman of, shall we say, a certain age, but one widely known for his young-at-heart approach to his work and life. Indeed, so young at heart is he that when he's trying to think, you often hear him dribbling a basketball in his office - I'll bet the folks downstairs love THAT – or tickling the "ivories" on an electronic keyboard he keeps close at hand.

These little distractions allow his active – dare I say youthful? – mind to sort of let go, loosen up, and allow his subconscious to find that eureka moment. You all know what I mean: that moment where suddenly, bursting rays of sunshine fall upon the object of your contemplation and all that was dark and in shadows is revealed in the light.

Anyhow, there we were celebrating this good friend's birthday when I thought about a very apt quote from the always quotable American philosopher (who happened to be a great baseball player) Satchel Paige.

Paige was one of the players whose skills should have, in a more equitable era, ensured him a spot on any big league baseball team in the nation. A slam dunk, if I can mix sports metaphors. It was his bad luck, and America's shame, that Satchel came of age in the pre-Jackie Robinson era. As such, he made his mark not in Major League Baseball but in the Negro Leagues. After Robinson broke the color barrier (as it is sometimes described) big league clubs started signing African American stars. If they wanted to stay competitive, they could hardly afford to ignore some of the best athletes in the game. Satchel was among those brought in early on, but by the time he donned a big league uniform, he too, had attained a certain age, an age he was very coy about discussing. Sportswriters were always trying to get him to spill the beans but on this topic, he was as hard to pin down as his fastball was to hit. That is, darned near impossible.

Okay, I'm getting around to that quote. One particularly pesky reporter wouldn't let go of the question: How old, America was asking, is this phenom named Satchel Paige. To which he answered: "Age is a case of mind over matter. If you don't mind, it don't matter."

Sure enough, that describes our birthday boy to a "T." He lives his life that way and it shows. And given the inventiveness of the folks we work with here at Sandia, I suspect it describes a lot of us.

* * *

Have you followed this new phenomenon, the social media-enabled alternative to traditional venture capital called crowdfunding? It's a scheme by which you describe your project online and invite everyday people to contribute money to its success. As a funder, you aren't buying a piece of the action; you get the satisfaction of knowing your investment is helping bring some great idea to fruition. Crowdfunding has been used to finance everything from video games, movies, and new personal electronic devices to personal dreams (one successful crowdfunding enterprise was a solicitation for funds so that an interfaith priestess could make a trip to Tibet).

The biggest – certainly in terms of ambition – project I've come across is by a Princeton, N.J.-based, outfit that says it can deliver a $500,000 5MW fusion reactor by 2020. To get there, using a novel approach it calls "focus fusion," the company needs $50 million. It's not seeking that much from crowdfunding; its immediate goal is to raise $200,000 online to get it to a crucial milestone, after which, presumably, the big boys – venture capitalists – will step in with serious money.

This is one of those things that we want to be true, oh, we almost ache for it to be true (remember cold fusion?). But isn't it also one of those things we know deep down is just too good to be true (remember cold fusion?) I think these are serious people with serious ideas; I just deeply suspect they're going to run into unanticipated complications all along their journey. I don't know enough about physics and engineering to scoff outright at this proposal but I've also been around long enough to be skeptical. I do wish them well. I might even toss in a few bucks before their campaign ends on July 5. As big a long shot as it is, I think the odds are still better than PowerBall.

See you next time.

Bill Murphy (MS 1468, 505-845-0845, wtmurph@sandia.gov)

FBI recognizes Sandian Tim Miller for assistance at computer forensics lab

Sandian Tim Miller (1535) has been recognized by the FBI for his work on analyses at the New Mexico Regional Computer Forensics Laboratory.

FBI Assistant Special Agent in Charge Bryan Finnegan, Forensics laboratory Director Mary Adkins, and Albuquerque police detective Jeff Abernathy, a forensic examiner at the lab, presented him with a certificate signed by FBI Director James Comey.

TIM MILLER

The certificate reads: "In recognition of your outstanding assistance to the FBI in connection with its investigative efforts. Your cooperation was of immeasurable help to our representatives. I share their gratitude for your support, which assisted them in carrying out their responsibilities. You can take pride in the role you played in the success achieved, and my associates and I congratulate you on a job well done."

Adkins told Tim: "We'll probably keep calling."

"This is really special," says Tim, who received the award June 9 during a Dept. 1535 meeting. He also credited his colleague, Byron Demosthenous (1535), who started the project.

"I enjoy doing this kind of work," Tim says. "It's important when the Labs can help out."

He had a hint something was up because manager Jody Smith told him he had to attend the meeting, but didn't say why. There also were three strangers in the room, and the first item on the agenda was "Special Recognition."

One of those strangers, Abernathy, worked with Tim on forensics, but the two had never actually met. Abernathy, who ran into Tim just before the presentation and realized who he was, kept his ID badge hidden so he wouldn't spoil the surprise. — *Sue Major Holmes*

Summer food drive

You still have time to donate to Community Involvement Dept. 3652's summer Roadrunner Food Bank (RRFB) drive until Monday, June 30. Donate through RRFB's secure website (http://tiny.sandia.gov/jb2gs) or by transferring money from your Sandia Laboratory Federal Credit Union account to Roadrunner Food Bank account 522830/00-01 for a general donation and /00-02 for the Food for Kids program. The last name on the account is "Roadrunner." The drive helps struggling families during the summer months when demand for food assistance remains high.

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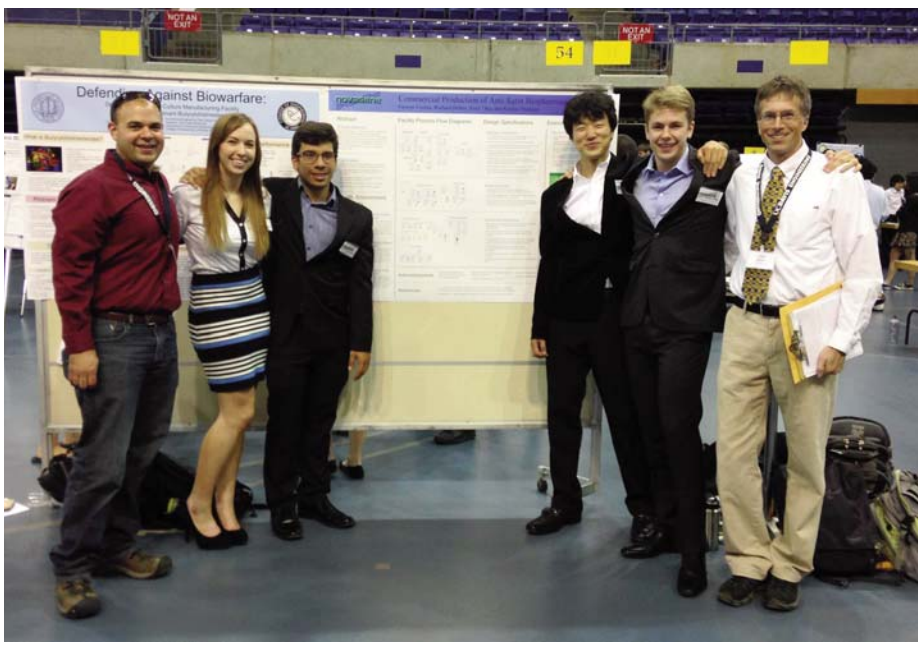
Sandia Award Honors UC-Davis Engineering Undergraduates

By Holly Larsen

Is commercial production of an anti-sarin drug in a rice cell medium actually feasible? The answer, according to a team of University of California, Davis engineering students, is a resounding yes! In fact, the students found that a biochemical processing plant they had designed in a feasibility study could significantly reduce the cost and increase supply of the current anti-sarin drug BuChE.

Sandia CaliforniaNews



SANDIANS Bryan Loyola (left) and Chris Moen (right) congratulate the UC Davis winners of the 2014 Sandia Engineering Design Award: Kaylee Thatcher (left), George Correa, Asun Oka, and Richard Huber.

An engaging report and presentation on their work was clearly convincing, because the four-member team of George Correa, Richard Huber, Asun Oka, and Kaylee Thatcher was honored on June 5 with the 2014 Sandia Engineering Design Award.

Now in its third year, Sandia's award recognizes engineering projects that demonstrate students' design innovation, strong communication skills, and impact on a national security topic. Applicants are judged on a written report and an oral presentation delivered at the annual College of Engineering Design Showcase. The winning entry is also recorded on a plaque in Kemper Hall, one of the university's engineering buildings.

"In offering this award, Sandia wanted to enhance engineering education, as well as build a pipeline of engineering recruits who think broadly and recognize the importance of innovation and communication," says Chris Moen (8238), who, in addition to administering the award, helped judge the competition. Other judges were Meiye Wu (8621) and Bryan Loyola (8226) of Sandia and Jean-Pierre Delplanque, associate dean of the UC Davis College of Engineering.

Chris emphasizes the importance of the requirement to undertake projects that touch on national security topics that align with Sandia's mission. "This focus helps the competitors connect engineering with very real national security needs and understand that national security topics can include natural resources and economic security."

The design award was created under a multi-year memorandum of understanding (MOU) with UC Davis designed to create opportunities for Sandia staff and UC Davis students and enable joint research projects that neither organization could pursue alone. That MOU has led to several research initiatives, as well as the design award and mentoring opportunities.

Google VP for Security and Privacy Engineering Eric Grosse on security and innovation in the face of rising threats

By Patti Koning

At a recent Sandia/California Truman Distinguished Lecture titled "Protecting the Cloud, Its Users, and Innovation," Eric Grosse, Google's vice president of security and privacy engineering, shared Google's strategies for Internet security, its efforts to gain transparency on domestic surveillance, and how Sandia can help Google.

"In the old days, security came in three different grades: military, enterprise, and consumer," Grosse said. "Security at the consumer level was not considered a major priority, but that's not the way it is today. The world has changed, and so have consumers. Gmail account owners include dissidents in countries with repressive governments — people who bravely put their lives on the line. They assume security people like me have done their job and are keeping their information safe. It's a tough standard to achieve, but it is where we are today."

He also spoke about another security issue: the US government potentially abusing its domestic surveillance abilities. "There are valid law enforcement and national security reasons for this, but there is also a real risk for abuse," said Grosse. "I don't believe that abuse is happening today, but there are not a lot of checks and balances to provide reassurance. With other governments, we would certainly expect abuse to happen."

Working with industry partners, Google launched the Google Transparency Report (https://www.google.com/transparencyreport/), which details the number of government requests for user information and the number of accounts affected in six-month increments (read the Google blog post at (http://googleblog.blogspot.com/2014/02/shedding-some-light-on-foreign.html) dating back to 2009.

CALIFORNIA SITE VP Steve Rottler presents Google VP Eric Grosse with a plaque in recognition of his Truman Distinguished Lecture Series talk at Sandia.

GOOGLE VP Eric Grosse said at a Distinguished Lecture Series talk that "it's time to make a big leap forward" in computer security.

"Just today I am pleased to say we are now allowed to report on FISA [Foreign Intelligence Surveillance Act] requests," said Grosse. "I want this to be a real way that anyone on the outside can judge what is happening. The data show that, at least for Google, there is not bulk surveillance through that legal channel. The number of accounts affected is modest — not as small as I would like, but not completely preposterous either."

Maintaining security an ongoing battle

Turning to security at Google, Grosse said the company focuses much of its efforts on red teaming. "I don't mean a set team. We pluck out a couple of employees and give them a few weeks to break into a test Gmail account using any means they can imagine. There is a referee so they don't take down Google or get into real user data, but they are doing it on a live system like a military readiness exercise."

He described this approach as tremendously helpful, to the point that Google security feels it has an idea of how often adversaries break in based on the performance of the red teams. "Our people are amazingly talented and creative at breaking in. Some of the stories would make your skin crawl," he said. "I have a standing offer to other organizations — including yours — to do symmetric red teaming, where you try to break into us and we try to break into you."

Google also has a Vulnerability Reward Program (http://www.google.com/about/appsecurity/reward-program/), known as the "bug bounty." The company pays independent researchers when they find and report qualifying problems on Google-owned web services, including Google, YouTube, Blogger, and Chrome.

"There are people earning an annual income by reporting bugs to us," said Grosse. "That's embarrassing to me because my team works really hard not to have any bugs. We have even tried to hire some of these people to come work for us."

Passwords are dead

Losing data through a loss of credentials is one of the biggest security problems on the Internet today, even bigger than malware, according to Grosse. "We've put a lot of effort into authentication issues," he said. "Sites are getting knocked over and losing their password databases."

To demonstrate the damage that hackers can do, he cited examples of James Fallow, who wrote an article in *The Atlantic* about his wife's Gmail account being hacked in 2011; Josh Bryant, who evaded an attempt to steal his @JB Twitter handle; and Naoki Hiroshima, who was blackmailed into giving up his @N Twitter handle.

"We have to declare that passwords are dead," Grosse said. "We're past incremental changes. It's time to make a big leap forward. At Google, we think public encryption is the way to go. Our goal is to have a public key smartcard so malware cannot steal the secret key credential from it. The idea is not that malware on the device can't misbehave because there is nothing to stop that. If the malware can act as you on the device, then the malware can misbehave. But at least once you close the lid, you have stopped the threat."

Grosse also strongly encouraged everyone in attendance to turn on two-step verification (http://www.google.com/landing/2step/) for critical accounts like email and banking and to add a phone number and backup email address to the recovery systems for these accounts. "If all we know is your password and that is the only relationship between you and Google, we don't have enough information to know if it is really you trying to recover your password or someone pretending to be you," he said. "This is a bad way to be."

In closing, Grosse made a request of Sandia — secure the grid. "We worry about mitigating all these different risks, but one big risk we can't mitigate is somebody cutting off the supply of electricity," he said. "I was surprised to learn at Google that we count our data centers in terms of the number of megawatts because megawatts are that hard to get locally. So, I really need you to help the power companies secure the grid. It's really important."

Sandia Cyber Technologies Academy offers free cyber and computer science classes to high school students. See story and photos on **pages 6-7.**

US, Japan conduct deterrence dialogue

The US and Japan held a bilateral Extended Deterrence Dialogue (EDD) in June in Albuquerque. The talks included a hosted visit of nuclear-related sites at Sandia to deepen understanding of the strategic weapons systems that support US extended deterrence guarantees, and how the US ensures its strategic forces remain safe, secure, and effective. In the photo here, the delegation shares a moment with its Sandia hosts, including Labs Director Paul Hommert (front center).

The EDD reinforces the credibility of the US defense commitment to Japan through discussions about strategic and conventional capabilities, and helps to promote regional stability from a near- and long-term perspective. The two governments regularly discuss deterrence as part of their broad security cooperation agenda and have held the EDD on a regular basis since 2010. Organizers of the visit included the US Department of State and Department of Defense. (Photo by Stephanie Blackwell)

Sandia, city of Albuquerque renew partnership pact

SANDIA LABS DIRECTOR Paul Hommert and Albuquerque Mayor Richard Berry shake on a new Memorandum of Understanding between the Labs and the city. "We have a lot of things to work on, a broad scope of issues," Berry said at the MOU signing. (Photo by Randy Montoya)

By Nancy Salem

Sandia has renewed a Memorandum of Understanding (MOU) that sets out a variety of ways the Labs can work with the city of Albuquerque. "This MOU is a well-defined vehicle to maximize our impact on the local economy," Labs Director Paul Hommert said at the MOU signing earlier this month.

The new three-year MOU will allow the city and Sandia to formally collaborate on projects such as energy infrastructure, advanced manufacturing, technology development, entrepreneurial growth, business assistance, telecommunications, cybersecurity, and computer modeling and simulation.

"This is an opportunity to strengthen an already strong relationship," Mayor Richard Berry said at the signing. "Sandia National Labs and the city of Albuquerque share a number of interests. This is good news for the community."

The MOU says Sandia and the city share goals including public safety and regional economic development, and that collaborative efforts on specific projects and technical issues will advance their respective interests.

"The city will benefit from Sandia's technical expertise and Sandia will benefit from access to the local community as a resource and problem-solving model," the MOU states.

Berry said he has enjoyed working with Paul as a friend and mentor. He said the city has used Sandia expertise on its information technology systems, engineering challenges, and in other areas.

"We have a lot of things to work on, a broad scope of issues," Berry said. "An important area is commercialization of research. We want to make Albuquerque a center of expertise in tech transfer. We are really, really fortunate to have Sandia as a partner."

Paul said tech transfer and commercialization are key missions of the Labs. "We are putting a lot of thought and effort into this," he said.

He said the MOU will make the city a better place for Sandians to live. "The city is home to a vast majority of Sandia employees and we want to help it succeed," he said. "We look forward to bringing our expertise to the issues."

Research Quality Standards case studies

How to manage your customer's stress level

Note: Sandia recently published a new* Research Quality Standards *document that, rather than providing a step-by-step set of requirements, focuses on case studies to define best practices in the world of research. Here is one case study drawn from the 50 in the document. From time to time the* Lab News *will publish others.

A Sandia researcher working on an important and high profile effort noticed that her customers tended to get more and more stressed as time went on as they waited for the next progress or status report. Occasionally her customer's manager, or even her own manager, would urgently request a status update without warning, resulting in interruptions to the work and delays getting the information put together for the update. Those delays then added to the customer's stress level.

For her own sanity as well as that of her customers, she came up with a way to short-circuit this "increasing stress" phenomenon. She developed a PowerPoint file with one slide for each commonly requested piece of information. Examples included background, purpose, value, project goals and objectives, risks and mitigations, budget and spending, approach, results, and anything else relevant to her customers and management.

Every Friday she would spend a few minutes updating each slide, changing the date on the PowerPoint file, and saving under a dated name (ex: "Project TBD July 12 2013.pptx"). By taking this approach she always had an up-to-date briefing file ready to go that was, at most, no more than a week old. In addition, because she saved all of her previous files, she had a week by week snapshot of what the project looked like at any point in time. When an unexpected request for a status update came in she could send the most recent file off within the hour without interrupting her work.

Occasionally, a tense customer might remember past events incorrectly. By forwarding the appropriate past status files she could immediately and unemotionally provide evidence of what had really happened at any point in the past (within a resolution of seven days). Her customers and management were impressed by how professional and responsive she was and how in control of all the details she was. The result? Their stress level was low, their confidence level was high, and customers enjoyed funding her and working with her. She became the "go to" person when a customer needed to tackle something really difficult.

Moral of the story

Customer and management stress tends to slowly build as time goes by without new information or results. Instead of letting it control you, create a briefing packet and update it once a week while saving previous versions. It will increase your effectiveness in communicating with customers and greatly lower everyone's stress level.

The entire *Research Quality Standards* document with 50 case studies addressing all aspects of research, is available as a PDF file at http://cto.sandia.gov.

WATER-SLEDDING — A Sandia rocket sled carrying a mission-related test package slows down in a water trough at the end of a test run on Sandia's 10,000-foot track. (Photo by Randy Montoya)

Sled track

(Continued from page 1)

watch — and it's hard not to get excited about the "shake, rattle, and roll" aspects — the mission couldn't be more serious. The Tech Area 3 facilities are critical to supporting Sandia's ongoing nuclear stockpile modernization work on the B61-12 and W88 Alt, assessments of current stockpile systems, and test and analysis for broad national security customers. But the test sites were aging. Many were built in the height of the Cold War and needed to be updated. A 2000 study indicated that to maintain Sandia's test capabilities, new facilities and upgrades were needed. That study prompted the massive Test Capabilities Revitalization (TCR). Below is the first in a series of stories in the *Lab News* that will take a closer look at the recent upgrades.

* * *

Arguably one of the most famous of Sandia's test facilities, the iconic 10,000-foot rocket sled track is known for its bright flashes, sonic booms, and sending large objects careening down the track at roughly the speed of sound.

The Rocket Sled Track offers a controlled environment for high-velocity impacts, aerodynamic and acceleration testing, and other conditions. Over the years, it has tested parachutes, aircraft, and space vehicles, and can also be used to support open-air burns.

More operational flexibility

"The TCR updates have given us a more robust and reliable facility. All the test control and instrumentation wiring systems and trackside boxes were replaced," says engineer and Rocket Sled Track Facility Director Michael J. Vigil (1533), who is part of a team that oversees tests at the Sled Track. He adds that the new trackside boxes provide more operational flexibility and more robust data. "It gives us increased confidence that we understand all our electronic signals and where they're going."

Paul Schlavin, who oversaw the TCR updates, estimates his team put in 120 miles of new wire up and down the track, with 25,000 connection points. "We completely rewired the power and data acquisition," he says. "It's a whole new system, and it's now a really robust system with fiber optics, camera stations, and blast-resistant walls to ensure that the system is protected."

In addition to new wiring, controls, and electronics, TCR provided funding to renovate existing buildings and tear down those that were aging. The result is a more streamlined system for conducting tests. With new wiring and trackside boxes located at regular intervals down the track, the operations can all be controlled from the Rocket Sled Track Control building. In the past, Sandia engineers relied on temporary wiring to a mobile trailer or other building in closer proximity to the tests.

Sandia's Rocket Sled Track is unique to the DOE complex and plays an important role in the overall weapons qualification process by validating many of the weapon systems' models. "We serve an important function in verifying and validating that those models are accurate or can be changed to be more accurate based on the real data that we provide," Michael says.

In the weeks and months to come, the team will rerun previous tests to ensure the life extension programs of some previously tested weapons are still valid. Upcoming tests also include shipping containers that hold radioactive materials to make sure they'll meet requirements.

"We're looking forward to moving ahead with more effective and robust testing," Michael says. "I think success will breed success, and we'll be able to do more tests at a higher level of quality with the recent upgrades."

LANL outpaces Sandia in first Step It Up Challenge

In the first-ever Virgin Pulse Corporate Cup Step It Up Challenge, Los Alamos National Laboratory employees outpaced Sandians on a per capita basis by almost 1,700 steps per day, winning bragging rights and a travelling trophy recognizing their achievement.

Los Alamos employees averaged 9,902 steps per day as measured on the ubiquitous Virgin Pulse pedometers that have been a familiar sight at Sandia for more than three years. Sandians logged 8,285 steps a day during the same May 5-May 18 competition.

In the world of Virgin Pulse, the program that encourages employee health and fitness, LANL is the new kid on the block. Sandia partnered with the organization (formerly called Virgin HealthMiles) three-and-a-half years ago. Los Alamos signed on with the organization at the beginning of this year.

According to Healthcare & Support Services Dept. 3334 Manager Renee Holland, Los Alamos proposed the challenge as a way to get its people engaged.

"Since May is National Employee Health and Fitness Month," Renee says, "it seemed like the logical time to do the challenge."

The Virgin Pulse group worked closely with the two labs leading up to the challenge, helping set up the ground rules and parameters and providing the corporate cup, which will travel between sites in the months and years ahead depending on the outcome of other challenges.

When the results of the challenge were tallied, 3,135 Sandians logged almost 364 million steps; LANL, with the newer program, had 1,519 participants who logged more than 210 million steps, easily outpacing Sandia's per-employee average.

Renee, who has been involved in Sandia's health and wellness program since she started at the Labs in 1995, says she has seen the Sandia culture evolve and become much more receptive to health, wellness, and fitness programs over the years. As a result, she says, "we've developed a very healthy population here at Sandia compared to similar demographic populations nationally." A healthier workforce is a good thing on its own terms, but also translates into health care costs that have been much more stable than those of some benchmark organizations around the country.

Although Sandia lost the first challenge, Renee says there will definitely be more challenges to come, challenges that may involve measuring other kinds of fitness activities.

"It's definitely something we plan to stay engaged with," she says. "We have a competitive spirit here at Sandia; we like to be the best of the best."

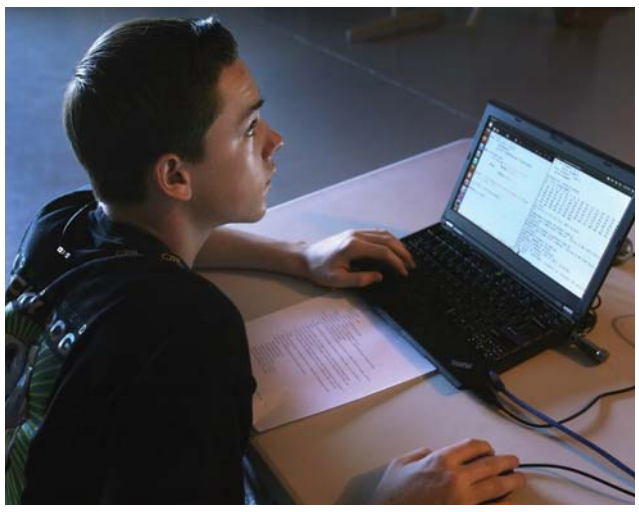
SANDIANS STEP IT UP at Hardin Field. LANL employees out-stepped Sandians this year in the first-ever Virgin Pulse Corporate Cup Step it Up Challenge. (Photo by Randy Montoya)

Sandia Cyber Technologies Academy offers free classes to high school students

CYBER TECHNOLOGIES ACADEMY TEACHER Craig Shannon (8966), a Sandia cybersecurity researcher, checks a student's progress on an exercise. Academy classes offer a mix of lectures and hands-on learning.

Story by Patti Koning
Photos by Dino Vournas

In the rapidly changing world of cybersecurity, who better to learn from than the professionals who live in that world every day? High school students are getting just that opportunity through Sandia's Cyber Technologies Academy, free classes for high school students interested in computer science and cybersecurity.



ACADEMY STUDENTS HAVE THE OPPORTUNITY to learn in a real-world environment with full-system access on an isolated network.

"The Cyber Technologies Academy is a critical piece of our talent pipeline strategy for cyber professionals," says Navid Jam (8965), manager of the information assurance group. "The sooner we can engage with students and shape their thinking about computer security and the hard problems we and the nation face, the sooner they can be part of the solution. These students will amplify our national security impact and develop a desperately needed national cyber capacity."

Jeremy Erickson (8965) and Steve Hurd (8958) started the academy after running the Center for Cyber Defenders (CCD) at Sandia/California, a summer internship for students from high school through doctoral studies.

The goal of the Cyber Technologies Academy is to take motivated students — even those with no computer experience — to a high level of cyber proficiency during high school. The classes combine instruction with hands-on learning, giving students an actual cyber environment in which to network and program.

Academy fills critical education gap

"We noticed that high school students entering the CCD had vastly different levels of skills and experience," Jeremy explains. "High schools are not well-equipped to teach cybersecurity. Most schools only offer basic computer science classes. It's rare to find a high school teacher with a computer science background, and high school computer labs typically aren't set up to run multiple operating systems and allow students to experience networking."

Drawing on their experience with the CCD, Jeremy and Steve realized Sandia already had the essential elements to teach cybersecurity to high school students — instructors, technology, and space. Jeremy, Steve, and Craig Shannon (8966) taught the first session of classes using Corporate Sponsored Community Service time off for K-12 education activities; computers and networking equipment are available through reapplication; and the Cybersecurity Technologies Research Laboratory (CTRL), which houses the CCD in the summer and had available space.

The academy was an immediate success. For the first session, which ran from March to May, the organizers planned for 54 students in three classes of 18, but quickly added a fourth session after 69 applied. The summer session also had more applicants than space available.

"I wanted to learn networking, which wasn't taught in my high school computer science classes," says Kimberli Zhong, a senior at Dublin High School. "The class is interesting, especially the hands-on exercises. We can put the concepts we learn into practice immediately."

Nikhil Singh, a sophomore at Foothill High School in Pleasanton, Calif., signed up for the academy because he's interested in a career in cyberintelligence.

"I'm taking computer science classes at my high school, but here we get to program in a 'real deal' environment," he says. "It's been a real eye opener to learn about other career paths in computer science."

Extending the academy's reach to teachers

The academy's summer session is underway — five weeks of classes that meet for four hours a week for students and a weeklong intensive session for teachers. Among the participants are students from 23 local high schools and nine students and teachers from several South Carolina schools.

"Clearly, there is a limit to the number of students we can reach directly," says Jeremy. "So we are offering teacher training and developing curriculum so those teachers can bring this instruction back to their schools."

That includes building the classroom exercises into a live CD, essentially an operating system on a disk. Once complete, the system will be available free of charge to schools. "This gets schools over the technology hurdle, because with live CD there is no need to install anything on a school computer, but students can still do cyber exercises in an authentic environment," he says.

The academy is seeking federal and private grants and partnerships to support further curriculum development. Sandians or retirees interested in sharing their experience and expertise through the academy can email cta@sandia.gov to find out about getting involved. Steve and Jeremy will be teaching summer session classes, along with Elisha Choe (8965), John Floren (8961), Kevin Hulin (8136), Thomas Kroeger (8965), Mike Kurtzer (89451), Gabe Nunez (8949), Greg Tubbs (LLNL), Kina Winoto (8965), and CCD interns Steven Barker and Nick Ward (both 8965).

In mid-August, the academy will begin taking applications for the fall program, which will run from September through November. The application and other details can be found at the academy website (https://share.sandia.gov/cta/). Selection is based on student motivation.

"We don't require any experience or prior knowledge in cyber," Jeremy explains. "We are looking for students with a passion for this subject, who have the potential to become the best and brightest in the field."

ACADEMY STUDENTS DON'T TAKE TESTS or receive grades — rather, the focus is on keeping students interested in cyber and building their skills.

ACADEMY CLASSES ARE KEPT SMALL so teachers like Kina Winoto (9865), above, can give individual attention to the students.

JEREMY ERICKSON (8965), ONE OF THE ACADEMY'S FOUNDERS, says building the program and teaching the students has been extremely gratifying. "I would have loved to take these classes when I was in high school," he says.

Cyber Technologies Academy graduates first class

JORDAN ROBERTSON OF *BLOOMBERG NEWS* shared with the academy graduates his experiences as a technology reporter .

On May 12, the Cyber Technologies Academy recognized its first set of graduates. There are no tests or grades in the program — rather, it offers innovative, hands-on learning opportunities that most students had never before experienced.

"This is an amazing day for all of us," said Jeremy Erickson (8965). "You all have inspired us to think well beyond the three courses we offered this spring. We would like to expand beyond Tri-Valley and bring this program into high schools across the country."

Jordan Robertson, a technology writer with Bloomberg News, shared with the students his experiences reporting on the cyber world for the last 10 years.

"Cyber is one of those rare fields where you can have independence and impact," he said. "Creativity, initiative, and even challenging authority are rewarded in this field. You can create your own opportunities and potentially have national, even international, impact."

He told the students about three researchers he has written about who exemplify this potential: Jay Radcliffe, who hacked the insulin pump that enables him to control his diabetes and ultimately forced medical device makers and the FDA to address vulnerabilities with wireless devices; Kristin Paget, now at Apple, who demonstrated how easily radio-frequency identification (RFID)-enabled cards can be hacked; and Barnaby Jack, best known for a 2010 demonstration of "Jackpotting" in which he remotely hacked into several different ATMs and caused them to spit out cash. (He died in 2013).

Robertson closed with some advice for the students — keep studying computer science. "A college degree in computer science, even if you don't go into that field, demonstrates competency in thinking and analysis that employers really like," said Robertson. "If you pursue computer science of any kind, you will have lots of options."

Sandia CaliforniaNews

STUDENTS RACE TO DETECT the source of a cyber attack in an in-class exercise.

STEM role models inspire Native American students

SCIENCE STUDENTS — Stan Atcitty (6111), at right in the photo above, describes his work at the Distributed Energy Technology Laboratory to participants in a recent Society of American Indian Government Employees training program, which offered a track for students attending tribal colleges and universities. Stan says he enjoys working with students and encouraging them to pursue science careers. "It's my heart to work with them and instill the fact that this is a good path and to stay on it," he says. In the photo at right, Julius Yellowhair (6123), right, explains the research done at the National Solar Thermal Test Facility and shows the students the facility's molten salt receivers. (Photos by Randy Montoya)

Supercomputing 'Test of Time' award won by Sandia researchers

By Neal Singer

The second annual "Test of Time" award for a technical paper that has had "wide and lasting impact" in supercomputing has been won by Bruce Hendrickson and Rob Leland, according to the awards committee of the Supercomputing Conference for 2014 (SC14). The supercomputing annual conferences are arguably the largest and most important supercomputing meeting every year.

ROB LELAND

Bruce and Rob's 1995 paper, "A Multilevel Algorithm for Partitioning Graphs," has been cited approximately 1,000 times, according to Google Scholar.

"For your research community to say you've done something of lasting value is deeply meaningful to any scientist," says Bruce, now senior manager for extreme scale computing (1420).

Rob, now director of scientific computing (1400), says he shares Bruce's sentiment. "When you publish something, you don't really know where it will go. It's a nice thing that SC is doing, looking back over history to see how things actually worked out."

The paper was considered one of the most influential contributions to high-performance computing. It was credited with laying the groundwork for efficient graph partitioning — a method of dividing a large, complex problem among the processors of a parallel computer by creating increasingly smaller graphs that preserve well the information of the large problem.

Its basic concept is still in wide use for solving problems concerning large data sets that cannot be described with equations, like keeping track of the country's medical records or shipping containers voyaging around the world.

The core idea involved making increasingly smaller graphs by successive approximations, performing whatever task needed to be performed on the small version, and then unfolding it to its original size.

"When you look at a graph, you can weight its vertices (representing objects, not angles) by their significance and their edges by how closely they are connected," says Rob. "You shrink the heavily weighted edges together, combine the vertices and achieve an accurate but simpler version of the initial, more complex problem. You just keep doing that, shrinking the problem but preserving the information, until the problem reaches a workable size."

The researchers wrote in their paper abstract 18 years ago, "Experiments indicate that, relative to other advanced methods, the multilevel algorithm produces high-quality partitions at low cost."

That basic approach became the dominant paradigm for a range of graph problems when it was implemented in an open-source Sandia code called Chaco, which magnified the impact of the algorithm. Chaco continues to be downloaded hundreds of times yearly, says Bruce.

BRUCE HENDRICKSON

"In my view," he says, "this paper was an important milepost in the still-growing relationship between computational science — historically driven by engineers and physicists — and theoretical computer science, in which algorithmic ideas are essential to make effective use of parallel computers. As we look forward, even more sophisticated graph algorithms will be needed to mediate between the architectural details of these increasingly complex machines and the engineers and scientists who want to run simulations on them."

Rob and Bruce have been invited to speak at SC14 in New Orleans in November.

Engineered Safety

Leaving nothing to chance in dealing with hazardous gases at MESA

By Sue Major Holmes

The Microsystems Engineering Sciences and Applications (MESA) staff leaves nothing to chance in dealing with the toxic gases the complex needs for its work.

Its system of positive verification is just one Engineered Safety system MESA uses in dealing with various gases. It limits the number of people who can order gas and what types can be ordered, controls the amount of gas onsite, inspects all cylinders — including checking for leaks — before receiving them from a delivery truck, and requires specific engineered controls on those cylinders. When they're in use, the cylinders are housed in specially designed exhaust cabinets, and gases are distributed to where they're needed through dual contained, stainless-steel tubing.

MESA also has procedures for getting cylinders into those cabinets. Its worst-case risk assessment scenarios involve the potential for dropping or tipping a cylinder while it's being moved or put into a cabinet when an old cylinder is empty and must be replaced.

A team studied "what if" scenarios, and required engineered controls on cylinders before they ever reach the gas cabinets.

Each cylinder has a pneumatic safety valve that requires an external pressure source to open. In addition, the valve has a cap on it, and the cylinder itself has another cap. Gas flow is limited by a special restricted flow orifice in the cylinder valve.

"If this were a pair of pants, it would have two belts and two suspenders," says manager Jon Snell (1741).

The gas cabinets are part of an automated system that verifies everything works as it should. A hazardous gas monitoring system with built-in redundancy and diagnostics monitors hundreds of sampling locations for leaks. A programmable logic controller (PLC) with built-in backups and diagnostics oversees the gas monitoring system, the exhaust system used to mitigate potential gas leaks, alarm pull stations and eyewash showers, high-sensitivity smoke detectors, and the building's fire alarm panels. If the PLC receives indications of a gas leak, it shuts down gases, triggers alarms to evacuate areas, and alerts emergency responders.

A committee meets weekly to review and ensure that any maintenance and construction work won't impact safety controls or reduce the level of protection. And while most of Sandia takes off on winter break, a MESA team remains on the job, inspecting and testing the safety systems.

DEALING WITH HAZARDS — MESA operates more than a dozen programmable logic controller cabinets like this one, which are part of an automated system that verifies everything works as it should in dealing with the hazardous gases the complex uses in its work.

Remembering an unforgettable friend of Sandia

Gen. Bob Smolen left an indelible mark on Sandia

Over the decades, many remarkable people have helped shaped the Sandia culture. In most cases, those people have themselves been Sandians, putting an indelible stamp on a unique institution. From time to time, though, an individual from outside Sandia makes such a connection, and has such an impact, that he permanently alters the landscape of the Labs. Such was the case with Maj. Gen. Bob Smolen, who helped define the modern Weapon Intern Program and made some lifelong friends along the way.

GEN. ROBERT SMOLEN

Gen. Smolen, who served from 2005-2007 as head of NNSA/Defense Programs, died in late May at the far-too-young age of 62 after a tough battle with cancer.

His passing was noted with both sadness and with some very happy reflections by his many Sandia friends. In a series of emails that traveled quickly around the Labs, they remembered him as a brilliant thinker, an unforgettable and charismatic leader, a devoted husband and father, and, in his lighter moments, as a fanatic Pittsburgh Steelers fan (he was a Pennsylvania native) and a near-obsessively passionate scuba diver who travelled all over the world to pursue a sport that one friend said "he loved more than life itself."

'Caught in his jetstream'

Gary Sanders, Sandia's deputy chief engineer for Nuclear Weapons & New Mexico Stockpile Systems (Center 2200), became close to Gen. Smolen after meeting him 1998. Gary accompanied the general on many of those scuba excursions. In a eulogy he delivered at Gen. Smolen's funeral in Washington, D.C., Gary said, "For the many here who don't know me, let me just say that I represent the many, many co-workers who became Bob's friends as we got sucked into the jet stream that Bob created as he went through life."

Gen. Smolen had a remarkable, and remarkably varied, career in the US Air Force. Given his skills, intellect, and disposition, he ended up spending a very substantial part of his career in increasingly demanding nuclear weapon and strategic planning-related activities.

Gen. Smolen's first formal encounter with Sandia came in 1998, when he was a colonel serving as the Deputy of the Air Force Nuclear and Counterproliferation Agency. At that time Gen. Smolen recognized the need to educate and foster a cadre of Air Force nuclear leaders. In Sandia's Weapon Intern Program he found the perfect vehicle for educating Air Force officers in the nuclear enterprise and for building a tight partnership with Sandia.

Helped expand role of Labs' Weapon Intern Program

With Sandia's buy-in, he created a program that selected three Air Force mid-grade officers into every Sandia weapon intern class. This practice continues today. Even when he rotated to other even more responsible positions, Gen. Smolen continued to champion and shape that process.

Andy Rogulich and John Hogan (both now retired from Sandia), were key players with the Weapon Intern Program in 1998. They worked closely with the then-colonel to integrate Air Force personnel into the program.

"Gen Smolen was so appreciative of our success," Andy recalls, that in 2003 he awarded the USAF Exemplary Civilian Service Medal to Andy, John, Steve Rottler (now Div. 8000 VP) and retired Sandia Senior Mentors Leon Smith, Ben Benjamin, Harold Rarrick, Tom Schultheis, Bill Patterson, and Hal Walling for their contributions to the United States Air Force.

John says he cherishes all the years of his friendship with Gen. Smolen, whom he describes as "the definition of an officer and a gentleman. He cared for everyone, especially the people who worked with and for him."

John relates an anecdote that, as much as anything, speaks to the character and class of the general.

"Several years ago," John writes, "Gen. Smolen surprised my father-in-law by showing up at the World War II Memorial in Washington, D.C., and presenting him with the certificates of the medals that he had earned but never received in WWII. At the end of the presentation, Gen. Smolen snapped a salute, surprising Cpl. Korringa. The honor of having a general initiate the salute was really appreciated by the elder World War II veteran and has become one of the most cherished memories in his life. That is a typical example of the measure of the man, Gen. Smolen. . . . He was a great personal friend and a good friend of Sandia National Labs. He will be sorely missed."

MAN FROM ATLANTIS? — No, but according to friends amd family, Gen. Bob Smolen loved scuba diving as much as he loved life itself. During an incredibly full and active life, Gen. Smolen and his family sought out the best dive sites all over the world. Gen. Smolen, who had many friends at Sandia, died in May.

Executive VP for National Security Programs Jerry McDowell knew Gen. Smolen for many years. Says Jerry, "He was consistently a gentleman and public servant, always open to other people's ideas and willing to mentor and encourage. He inspired me to the virtue of public service and he had a great sense of humor."

Jerry recalls a trip to Washington when he visited with Gen. Smolen during the general's tenure as commander of the Washington District in the time after the 9/11 terrorist attacks.

"We were sitting in his office and I commented on the sound of a military band in the distance. With pride he noted that one of his duties was to manage the ceremonial military band that performed at special government events. No public service job was too small for his passionate leadership. We were blessed to have his wisdom in challenging times."

'He never led us astray'

In his eulogy for the general, Gary said, "As I look around, I see many people whose current and past careers were orchestrated by Bob for the good of the nation. He was hard to resist as he would become impassioned about the critical needs of the nation, the Air Force, the Department of Energy, and the labs, and would then convince you that you were the critical piece to helping to fix something.

"People moved to new cities, changed agencies, pursued degrees, and more because Bob had a vision that each of his friends could — and should — be the head of whatever agency they were in. He showed such faith and confidence in each of us that it was impossible to say no. Even when we were reluctant, and Adriane [the general's wife] would advise us to 'just tell him no,' it was nearly impossible not to follow him. And, I have never heard anyone say that he led them astray."

Gary says he used to kid Gen. Smolen that he reminded him of Superman because he was able to cram so much work and fun into every day. Like many busy people, he always seemed to have time for something else. But, Gary said, he wasn't Superman. Like that great superhero, he had his own kryptonite.

"I found out that he was afraid of heights — while we were climbing a pyramid in the Belize jungle! Not good timing since he was a bit heavy to carry down. Yet he floated off the edges of underwater cliffs with no concern at all. And he was afraid of spiders — which seemed strange since underwater many things look like arachnids — from banded shrimp to spider crabs; even lobsters are just giant spiders. But that was all different for him underwater."

And unlike Superman, Gary noted, he got plenty banged up from time to time, sometimes seriously, pursuing his passion for scuba diving.

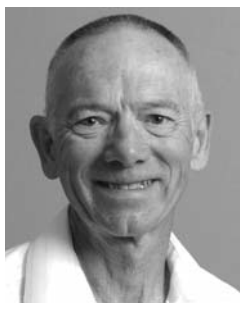
"The legacy of a person isn't their invulnerability," Gary said, "but the betterment and achievement and love of those who are touched by the person. I don't know of anybody who associated with him who wasn't influenced by Bob."

As much as he influenced the lives around him, as much as he welcomed people into his circle of friends and even family, Gary said, Bob Smolen's heart "was with Adriane, Mandy, Robby, and Emily [his wife and children]. Over the years, I must have heard weeks' worth of how proud he was of his family — even as they found their own paths in life." — *Bill Murphy*

GEN. BOB SMOLEN, second from left, at a dive shop at Truk Lagoon in the South Pacific. With him are several diving partners, including Gary Sanders (2200), second from right, a friend of many years' standing who delivered the eulogy at the general's funeral. Joining Gen. Smolen and Gary are Mike Vergino, left, retired from Lawrence Livermore National Laboratory, and Sandia retiree Dave Olson, right. (Photo courtesy of Gary Sanders)

Mileposts

New Mexico *photos by Michelle Fleming*
California *photos by Randy Wong & Dino Vournas*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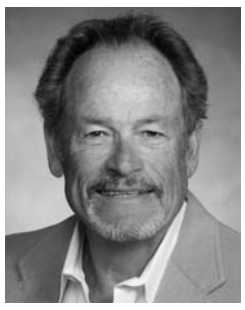
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Recent Retirees


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Rickey Hartzell
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Florian Lucero
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Jack Wise
35 1646


Jim Blankenship
30 5436


Bill Cordwell
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William Filter
31 5785


Cher Porter
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Timothy Crawford
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Nathan Golden
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Philip Kahle
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David Keese
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Clinton Landron
30 5353


Linda Stiles
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Kevin Marbach
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David Muron
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John Nagel Jr.
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Beth Richter
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Clara Gallegos Chacon
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David Harding
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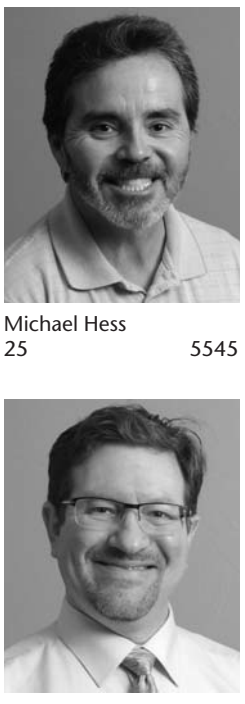
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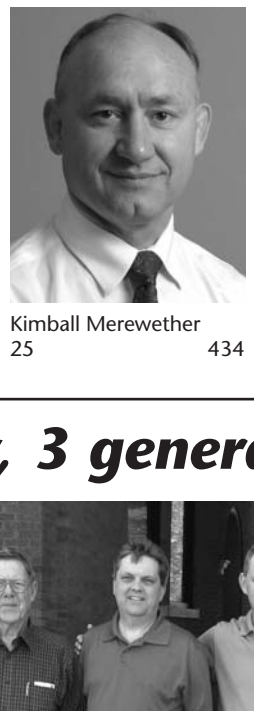
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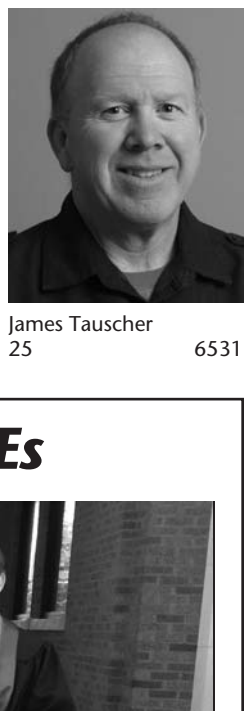
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William Hart
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Steve Showalter
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Matt Kerschen
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Eileen Rios
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Anita Schreiber
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Geno Tenorio
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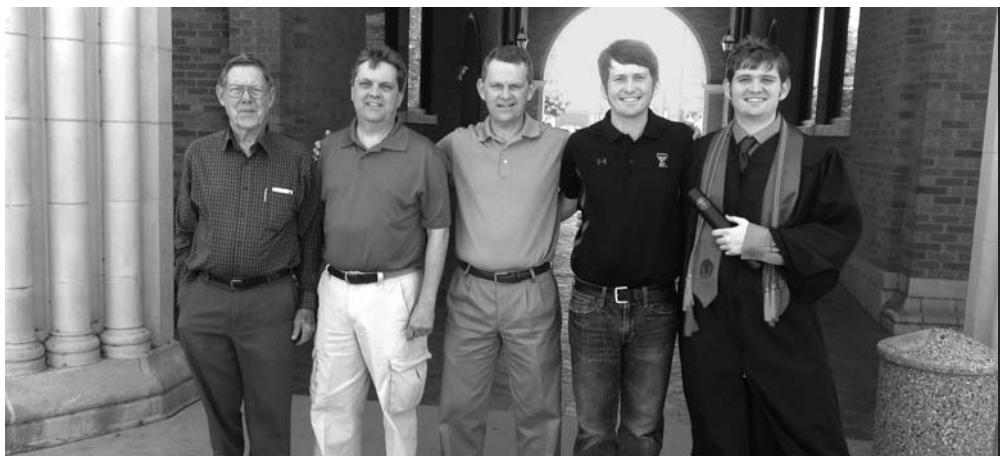
1 family, 3 generations, 5 EEs



IS IT IN THE WATER? — Sandia retiree Tommy Donham, left, who worked at the Labs for 37 years, inspired his two sons, Brent, second from left, and Craig, center, to follow in his footsteps. The three men all earned electrical engineering degrees from New Mexico State University. In due course, Craig's oldest son, Scott, second from right, earned his EE degree from Texas Tech University and now Craig's youngest son, Kevin, right, is keeping up the family tradition, have just earned his EE degree, also from Texas Tech. Tommy, a farm boy from Melrose, N.M., was the first in his family to go to college, setting a high bar that succeeding generations have continued to clear. (Photo courtesy of Craig Donham)

Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads

MISCELLANEOUS

SLATE POOL TABLE, Olhausen, 8-ft., hardly used, $1,200 OBO. Heck, 681-1314.

CAMPAIGN DESK & CARSON BOOKSHELF, Threshold, red, 5-shelf bookcase, <1 yr. old, like new, $100. Cooper, 720-530-3084.

ALL-WEATHER MATS, for Honda Pilot, Weather Tech, fits '09 or newer, 3 rows & cargo, $150. Raether, 363-1631.

DINING ROOM SET, wood, veneer carved table, 66" x 44", 2 24-in. leaves, 8 elegant hand-carved chairs, $1,350. Outkin, 505-695-0356.

CHILDREN'S PLAY KITCHEN, IKEA Duktig, w/top, $40; Step2 Naturally Playful sandbox, w/o sand, $20. Madsen, 610-0725.

GRILL & SMOKER BBQ, charcoal, Termos brand, 1 yr. old, used once, $75 OBO. Marchi, 385-7671.

COOK TOP, stainless, Jenn Air, w/downdraft ventilation, older model w/electric burners, call for photo, $100. Stiles, 275-2941.

WINDOW AIR CONDITIONER, Frigidaire, 5000-BTU, used only 1 summer, $120 new, asking $90 OBO. Couphos, 973-214-0923.

GLASSWARE GOBLETS, Homer Laughlin Fiesta Elegance, 10 glasses, cobalt blue bands at bottom, discontinued, $45. Hall, 280-4344.

PORTABLE ROOM AIR CONDITIONER, Amcor, 9,000-BTU, w/remote, floor model. $150 OBO. Smith, 209-815-2176.

PIANO, Rudolph Wurlitzer Spinet, w/matching bench, warm honey color, 1982, good condition, will deliver, $400. Cincotta, 505-306-4188.

CHAIR, La-Z-Boy, rocker/recliner, fabric, modern pattern of earth tones & burgundy, <1 yr. old, still tagged, photos available, $350 OBO. Noack, 828-1180, ddnoack@q.com.

OSCILLOSCOPE, Tektronix 541, w/scope mobile, 3 plug-ins, tall, roll around relay rack & more vacuum tube test equipment, call for details. Hansen, 898-3173.

WHEEL/TIRES, from '03-'07 Dodge Caravan, factory, alloy wheels & tires, photos available, $350. Watkins, 294-6808, wattyinabq@hotmail.com.

SHIRLEY TEMPLE SHEET MUSIC, "That's What I Want for Christmas," $40. Thompson, 298-8954.

DRAW-LEAF TABLE, Teak, 51" x 34", w/2 20-in. self-storing leaves, w/4 matching chairs, neutral Southwest print, $300. Caskey, 710-3593.

MOTORCYCLE HELMET, HJC model CS-2N, half-helmet, XXL, matte black, worn twice, in box, $50 OBO. Cocain, 281-2282.

COMPLETE DVD SETS: PBS mysteries (Morse, Lynley, Christie & more), call for complete list, prices. Sieradzki, 292-5049.

PROJECTION TV, DLP, Mitsubishi, 58-in., great condition, $200. Valdez, 999-0100.

OAK DRESSER, antique American, bow shape, call for photos, $100. Diaz, 821-0868.

BELT/DISC SANDER, 4" x 36" (belt), 6-in. (sander)., $40; men's gold wedding band, new, size 11, women's 14K gold & diamond cocktail ring, size 6. Vigil, 400-0639.

ART HISTORIAN SPEAKING on "The Cat & Human Spirituality Through the Ages," July 13, www.fabulous-Felines.org. Stubblefield, 298-2991.

LARGE ALOE VERA PLANT, in 14-in. brown & beige planter, $25. Dockerty, 828-0745, ask for Bob.

FISHING RODS/REELS/CASE, 2 nearly new, child's rod, full tackle box, nice camp knife/sheath, $100. Siegrist, 293-4148.

KING BED, frame, box spring mattress, $200; twin bed frames, 2, box springs, mattresses, $50 ea. Mozley, 884-3453.

SEWING MACHINE, Lotus 100 N, small, 11" x 13" x 6", $60; Schwinn Airdyne bike, $175; pneumatic paint shaker, call for info. Herrera, 833-5035.

TRANSPORTATION

'14 SUBARU WRX PREMIUM, sedan, 4-cyl., turbo, Catback exhaust, ~6,200 miles, pristine condition. $27,500. Urioste, 505-918-4054.

'97 HONDA CRV, 4x4, Alpine stereo, Bluetooth, iPhone sync/USB port, alarm, 227K miles, clean, $3,950. Nation, 385-2491.

'01 FORD F150, Supercrew, camper shell, running boards, 137K miles, $8,900. Kincaid, 296-6014.

'92 FORD F350 XLT, 4-dr., 460, AT, hitch, new tires, 204K miles, strong work truck, $1,750. Yarberry, 821-1002.

'03 TOYOTA COROLLA LE, 1.8L, 4-cyl., AT, premium wheels, tint, silver, 87K miles, $7,800 OBO. Pratt, 301-1557, ask for Alex.

'91 TOYOTA PICKUP, V6, 5-spd. manual, 136K miles, excellent condition, absolutely perfect inside & out, $8,500. Armstrong, 299-8705.

How to submit classified ads

DEADLINE: Friday noon before week of publication unless changed by holiday. Submit by one of these methods:

- **EMAIL: Michelle Fleming (classads@sandia.gov)**
- **FAX: 844-0645**
- **MAIL: MS 1468 (Dept. 3651)**
- **INTERNAL WEB: On internal web homepage, click on News Center, then on *Lab News* link, and then on the very top of *Lab News* homepage "Submit a Classified Ad." If you have questions, call Michelle at 844-4902. Because of space constraints, ads will be printed on a first-come basis.**

Ad rules

1. Limit 18 words, including last name and home phone (If you include a web or e-mail address, it will count as two or three words, depending on length of the address.)
2. Include organization and full name with the ad submission.
3. Submit ad in writing. No phone-ins.
4. Type or print ad legibly; use accepted abbreviations.
5. One ad per issue.
6. We will not run the same ad more than twice.
7. No "for rent" ads except for employees on temporary assignment.
8. No commercial ads.
9. For active Sandia members of the workforce, retired Sandians, and DOE employees.
10. Housing listed for sale is available without regard to race, creed, color, or national origin.
11. Work Wanted ads limited to student-aged children of employees.
12. We reserve the right not to publish any ad that may be considered offensive or in bad taste.

'12 FORD MUSTANG, V6, AT, silver, loaded, extras, >5.2K miles, excellent condition, $20,000 OBO. Yip, 505-294-8124.

'11 DODGE GRAND CARAVAN CREW, 3.6 LVVT, loaded, DBD, back-up camera, stow & go seats, 34K miles, excellent, $17,600. Lusader, 505-459-3177.

'05 TOYOTA MATRIX, AWD, AT, dark gray, great mpg, Michelins, 146K miles, excellent condition, $5,300. Dwyer, 271-1328.

'01 LAND ROVER, Discovery Series II, stock wheels included, ~86K miles, $11,000 OBO. Trujillo, 505-839-5210.

'08 HONDA PILOT EX-L, 2WD, silver, 1 owner, garaged, clean, 51K miles, $17,800. Enghauser, 344-0309, ask for Mike.

'13 SUBARU LEGACY LIMITED, 4-cyl. w/CVT, silver/black leather, always garaged, only 8,675 miles, $22,000. Shaw, 980-7491.

'92 FORD F150, 5.8 V8, 4WD, AC, 150K miles, $3,000 OBO. Alford, 928-220-1268.

'93 JAGUAR XJS, 6-cyl., 4-spd., AT, 85K miles, needs some body work, good condition, $3,700. Stephens, 804-5705.

'07 FORD EXPLORER XLT, 4WD, V6, 4L, luggage rack, tow pkg., charcoal gray, 77,360 miles, $11,900. Draelos, 225-0473.

RECREATION

'95 GULFSTREAM RV, Class A, 34-ft., 2/slide out, 18-ft. awning, 460 Ford gas engine, 14K original miles, new tires, 6.6-KW generator, $22,250 negotiable. Garcia, 554-2690.

'05 KAWASAKI NINJA 250R, only 2,400 miles, clear title, great condition, $3,000. Chacon, 505-450-4321.

'06 KAWASAKI VULCAN V2K, new tires, some add-ons, never been dropped, 15K miles, $6,500. Metcalf, 505-264-5456.

'11 SPECIALIZED TRANSITION PRO, small, w/'12 Zipp Firecrest 404 wheels, Quark Rotor power meter, $3,200. Uekert, 307-3304.

'12 FOREST RIVER FLAGSTAFF V-LITE TRAVEL TRAILER, 30WRKSS, 2 slides, 1-1/2 baths, extras, mint condition, $22,500. Sandoval, 792-7883.

'02 YAMAHA ROADSTER SILVERADO XV16A, new tires, low mileage, showroom condition, $5,800. Chacon, 505-897-4566.

ALUMINUM BOAT, 14-ft., Mirrorcraft, trailer, trolling motor, outboard motor, $4,600 OBO. Morgan, 269-6650.

'04 YAMAHA FJR, 1300 cc, sport touring motorcycle, direct drive, ABS brakes, rain suit, helmets, 24K miles, $6,500. Lifke, 220-2021.

'05 KYMCO PEOPLE 250 SCOOTER, w/trunk & trickle charger, 12K miles, well cared for, $1,500 OBO. Verley, 410-9885.

MOUNTAIN BIKE, Santa Cruz Blur Classic, Avid speed dual disc brakes, XT group, $800 OBO. Rector, 286-1217.

REAL ESTATE

REMODELED HOME, 1,644-sq. ft., 824 Pawnee NE, move-in ready, $160,000 or make offer, cash or finance. Sanchez, 505-400-0030.

4-BDR. HOME, 3 baths, 4,280-sq. ft., pool, full walkout basement, Four Hills, gorgeous, www.lampostcircle.com. Ramos, 972-951-0290.

3-BDR. HOME, 2 baths, 2,000-sq. ft., .8 acres, turn-key, Los Lunas, $245,000. Walker, 565-1799.

3-BDR. HOME, 2 baths, 2,365-sq. ft., partial adobe, workshop, RV hookup, .80 acre, water rights, Southwest, 20 mins. to base, MLS# 810274, $261,325. Warner. 507-3460.

4-BDR. HOME, 1,405-sq. ft., nice home in NE Heights, Google 1825 Carol NE, motivated seller. Langwell, 505-350-1313.

3-BDR. HOME, 2 baths, 1,271-sq. ft., Volterra subdivision, 4 yrs. young, MLS#810836, $197,900 negotiable. Cox, 505-440-0643.

3-BDR. HOME, 2-1/2 baths, 2,029-sq. ft., garden, tile roof, quiet neighborhood, <5 mins. to Eubank gate, $270,000. Dinge, 505-818-8933.

3-BDR. HOME, 1-3/4 baths, 2-car garage, 2,115-sq. ft., 2809 Utah Street, NE, 87110, $254,000. Garcia, 505-321-8664, ask for Alice.

WANTED

DEDICATED REFEREES, for flag football association, officiating/football experience a plus for this fun league. Pacheco, 505-508-6442.

FEMALE ROOMMATE, furnished bdr. on base, $500. Caldwell, 859-358-4553.

RELIABLE VEHICLE, for student, reasonably priced, must be in good running condition. Sanchez, 842-5289.

YARD WORK, seeking reliable, hard-working person, enjoys yard work & attention to detail. Luther, 505-822-1187.

ROOMMATE, share 3-bdr. home, off Unser/Ladera NW, washer/dryer, WiFi, cable, backyard w/city views, private bath next to furnished bdr., $600 w/utilities. Sanchez, 505-720-1119.

ROOMMATE(S), Volterra, 5 mins. To KAFB, no pets, late September. $550/mo., utilities & WiFi included. Guillen, 505-385-8189.

GOOD HOME, 2 cute cats, very friendly, like people, ~ 4yrs old. Stephens, 804-5705, ask for Jack, 489-4252, ask for Jill.

RECORDER/PLAYER, hand-held. Underhill, 294-5774.

CHILDREN'S SKIS, 7, 5 & 4 yrs. old, new skiers, looking for skis, boots, helmets. Sais, 999-1270.

Lockheed Martin Comet Award

Community Involvement manager Amy Tapia (3652) accepted a Lockheed Martin Comet Award Wednesday, April 30, on behalf of the Maintain No Gain campaign, which used wellness and community outreach in an innovative way to win in the Employee Experience/Community Impact category.

The Maintain No Gain program encourages employees to maintain or lose weight, rewarding their success with a Roadrunner Food Bank donation. For each week a participant maintained or lost weight, Community Involvement donated $5 to Roadrunner Food Bank, for a maximum of $50 per participant.

"In the past, we had fewer than 20 percent of participants complete the program and only a handful maintain their weight, and a smaller handful lose weight," says dietitian and project lead Jessika Brown (3334).

Jessika says the program raised $5,680 this year, doubled the number of participants who completed it to 162, and the amount of weight lost (398 lbs.)

Health Management Clinic and Preventive Health hosted 1,396 weigh-ins of which an average of 81 percent of participants maintained or lost weight.

Roadrunner Food Bank provides food to 40,000 people weekly. For every dollar donated, more than five meals are distributed within the state.

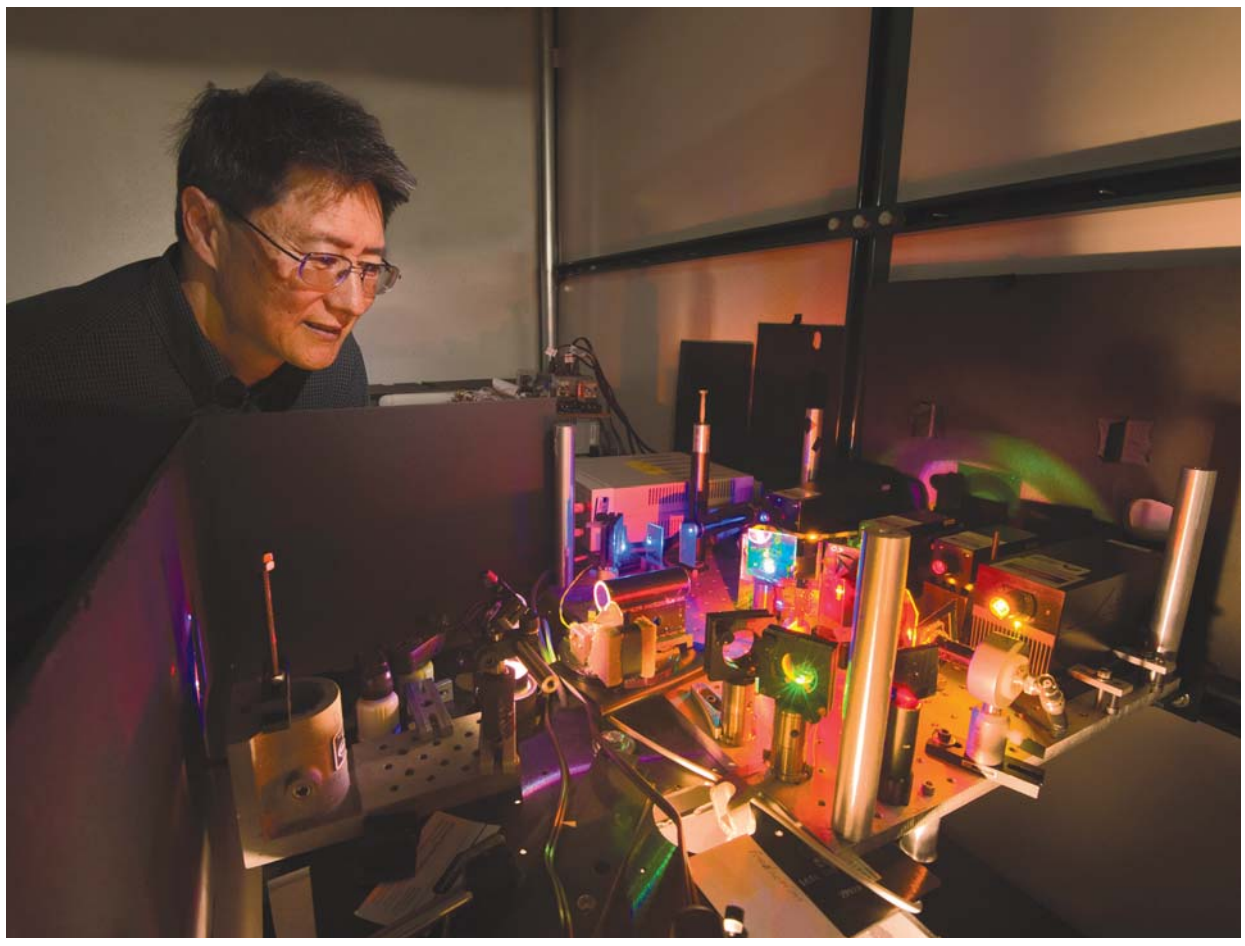
The Comet Awards are Lockheed Martin's annual award program recognizing best practices in communications and exceptional contributions to the business.

"Receiving a Comet Award was an honor, but the best part of the program was that it helped people facing food insecurity and resulted in healthier employees," Amy says.

HR AND COMMUNICATIONS Div. 3000 VP Pam Hansen Hargan, right, joins Community Involvement Dept. 3652 staff members Patty Zamora, left, and Pam Catanach, second from left, and Healthcare and Support Services dietician Jessika Brown as they show off the Comet Award trophies they received for the innovative Maintain No Gain program, which combined wellness and community outreach in a unique way. Dept. 3652 Manager Amy Tapia is directly beside Pam.

Power to the people

Semiconductors have had a mind-boggling impact on society. But your sleek cell phone and trusty GPS are only the beginning. Smaller, faster electronics are still to come.



JEFF TSAO (1120) looks over a set-up used to test diode lasers as an aternative to LED lighting. (Photo by Randy Montoya)

By Nancy Salem

Semiconductors are sneaky. Little by little they permeate your life, unnoticed until you stop and think. Remember mammoth cell phones and boxy computers? Remember being lost? "Our lives become more convenient, flexible, dynamic, and agile every day," says Sandia Fellow and materials scientist Jerry Simmons (7000). "Semiconductors are the reason why."

All modern electronics need semiconductors, which at the most elemental level simply switch electricity on and off. At opposite ends of the electrical spectrum are conducting materials, such as copper and aluminum, used in wires through which electricity is sent, and insulators that keep electricity from flowing out of the wires, causing shocks. "In between are semiconductors that can switch back and forth from conducting to insulating," Jerry says. "When hooked together in complex ways, you get high performance computing. But semiconductors serve other functions like optical communications, imaging, and switching electrical power — also known as power electronics. As the semiconductors get more efficient, so do entire systems."

Silicon, as in Silicon Valley, has long been the go-to semiconductor material for computing and power electronics. But a new generation of materials is taking hold that could lead to smaller, lighter, more powerful, and versatile devices. The rising stars are III-Vs, graphene, wide bandgaps, and metamaterials, each of which will push electronics, and modern life, to new places.

III-V: See the light

Jerry says one area in which silicon falls short is the handling of optical processes. "There are a lot of applications where you want something to absorb a particle of light or emit a particle of light," he says. "People have used various non-silicon semiconductors to do that."

Those innovations helped revolutionize telecommunications because optical fibers use light to carry computer signals. "The Internet is based on semiconductor devices that absorb a photon on the receiving end or emit a photon on the transmitting end," Jerry says. "It was a generation of semiconductors worked on in the 1970s and '80s that allowed optical internet communication to take place."

Sandia is developing optical materials that will do even more. One innovation is solid state lighting powered by a new class of III-V semiconductors, so called because they combine elements from groups III and V of the periodic table. Using indium gallium nitride and aluminum gallium nitride, Sandia engineers have made some of the first high-intensity blue and ultraviolet light-emitting diodes, or LEDs.

"We had to learn how to grow the material thick enough to make an LED inside a growth chamber," Jerry says. "You have different layers in the LED structure. The thickness of the quantum wells has to be well defined and controlled to within a single atomic layer."

Sandia was a pioneer in that material system and helped make possible the white LEDs that are penetrating the market, replacing incandescent and fluorescent bulbs. Also developed were LEDs in ultraviolet wavelengths used in military applications and to purify water.

Researchers are extending the same gallium nitride-based materials into power electronics. "Instead of an information signal in your computer — tiny little currents of micro- or nano-amps — we're looking at switching hundreds of amps to supply electricity from the grid to entire neighborhoods," Jerry says. "The materials will make everything smaller, lighter, more efficient, and more reliable."

Graphene: Strength in layers

Graphene is a one-atom-thick layer of the mineral graphite in which carbon atoms are arranged in a hexagonal pattern. It's strong, light, and nearly transparent, an excellent conductor of heat and electricity with the potential to create ultra-small and fast components in electronics. Wafer-scale graphene can be engineered and integrated to other semiconductors, producing tailor-made components for applications in such areas as spintronics, biosensing, and bioanalytics.

"Graphene is just in its infancy, but the potential number of applications is mind-blowing. Because it is only one atom thick, it is easy to modify the surface or the edges of a strip of graphene and control its properties. So this can make very tiny, low-power switches," Jerry says. "Or you can put two layers of graphene on top of each other and make a photon detector."

Metamaterials: Second nature

Metamaterials are engineered to have properties not found in nature. Atoms and their arrangement in a material determine its properties. "It turns out you can make artificial atoms by shaping the material on a nanoscale, and as long as the shaping is significantly smaller than the wavelength of the energy it's interacting with, it looks homogenous," says Rick McCormick, senior manager in Radiation, Nano and Optical Sciences Dept. 1110. "You can't tell the difference between the atomic response and the response of the shaping."

By changing geometry at the nanoscale, materials can be artificially engineered to create a response that doesn't exist in nature. "It opens the door to making artificial atoms at artificial frequencies," Rick says. "Theoretically, that gives you a big knob to turn on material properties. We're not stuck with what nature gave us."

An example of such a property is the way a material responds to light. "Normally, when light passes through glass, like a prism, the light gets bent in a certain direction," Rick says. "By using metamaterials, we can make the light bend in an opposite direction to what occurs in nature. This allows us to do new things with light including non-visible light, like infrared and radio waves, that were never imagined before."

Examples include ultra-thin lenses, ultra-efficient cell phone antennas, and ways to keep satellites cool and photovoltaics more efficient. A recent Sandia Grand Challenge research project headed by Rick and funded through the Laboratory Directed Research and Development (LDRD) program advanced the state of the art in metamaterials from two-dimensional metafilms to three-dimensional materials, research that won an R&D 100 award.

The work led researchers to look at optics in new ways, including using metamaterials in an invisibility cloak to shield something from view by controlling electromagnetic radiation.

"Metamaterials have given us a bunch of new theoretical, computational, and experimental tools to explore the way light interacts with matter at a very small scale," Rick says. "Now we can play with that in a new way."

Wide bandgap: Hot topic

Electronic bandgap is a fundamental materials property. Wide-bandgap (WBG) materials such as silicon carbide and gallium nitride are semiconductors with bandgaps significantly greater than that of silicon. Wide bandgaps have already revolutionized lighting. But as transistors, or switches, in modern power electronics they also have the potential to vastly improve the performance of electrical power grids, electric vehicles, motors in buildings for elevators and HVAC systems, and even computer power supplies.

WBG materials can handle high temperatures and voltages, properties that could lead to simpler, less costly power conversion systems. WBG has the potential to substantially reduce the estimated 10 percent energy loss between generating electricity and transmitting it into a home or business. A wide bandgap allows faster switching.

"In a decade or two the giant transformers in your neighborhood distributing power from the electric grid to homes, that now weigh 10,000 pounds, will be replaced by things the size of a suitcase that weigh 100 pounds," Jerry says.

And if electric vehicles could tap the potential for WBG power electronics to withstand higher temperatures, they might not need a liquid cooling system, reducing the system's complexity and improving vehicle range because the car would weigh less.

Modern family

Jerry says Sandia is looking ahead to new classes of semiconductor materials that could help meet the Labs' national security mission. Photon detectors are an example. "New photon detectors can image battlefields or landscapes in frequencies that we haven't looked at before," he says. "It's a new generation of materials that gives us that capability."

Where is the next generation of semiconductors leading? Jerry says to dramatic changes in the way people live. Some revolutions transform life in a striking way, as in buying an LED light bulb that uses less energy and saves money. Others sneak up, such as the realization over time that cell phones do much more in a much smaller package.

"Semiconductors have progressed over time to the point that the density of transistors and computing chips is mind-boggling," Jerry says. "They are embedded in systems like cars and cell phones and home appliances. They allow us to have our modern-day lifestyle.

"But we always have to be out on the frontier looking for the newest discoveries and picking things to develop further. So if we talk about semiconductors again in two or three years, the topics will likely be dramatically different but equally exciting."